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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR  
OF LIMITED DISTRIBUTION, NO. 20: ORIENTAL FRUIT FLY

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Order: Family

Diptera: Tephritidae

Pest

ORIENTAL FRUIT FLY  
Dacus dorsalis (Hendel)

Economic  
Importance

This fruit fly, one of the world's most destructive pests of soft fruits, was introduced into the Hawaiian Islands about 1945 and developed to high populations by 1948. Based on what has occurred in Hawaii, this species is more dominant and aggressive than the melon fly, Dacus cucurbitae Coquillett or the Mediterranean fruit fly, Ceratitis capitata (Wiedemann). It seems certain that under favorable conditions, D. dorsalis could survive and reach damaging numbers in the southern parts of California, Texas, or Florida (Armitage 1949, Boyce 1949).

Females have invaded fruit stands inside stores and laid their eggs in imported fruits. Although bananas are not usually attacked by fruit flies in South India, larvae were found tunneling in the pulp of bananas brought from Bangalore. It is considered to be one of the most important tephritids in India.

Although most literature does not indicate D. dorsalis to be as important to citrus as C. capitata, a report from Sri Lanka noted that unprotected grapefruit had been heavily attacked. This species has also been cited as a serious citrus pest in Taiwan (Oakley 1950b). In Hawaii, D. dorsalis is destructive to all marketable fruit crops except pineapple and strawberries (Drew 1978).

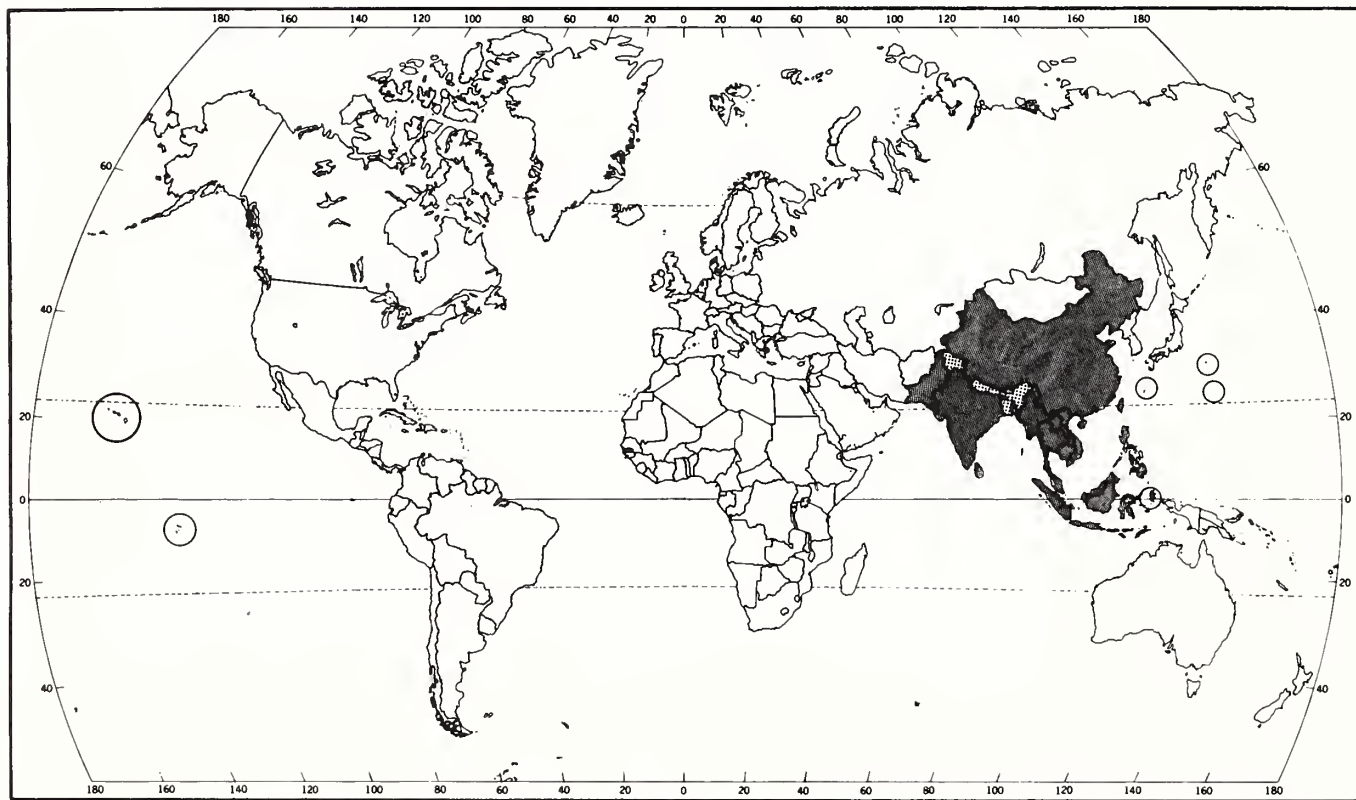
Pakistan reported an instance of 50-70 percent infestation of peaches and pears in 1 area. In a second area 50-80 percent of loquat, apricot, guava, and fig crops were attacked in succession from April to October, while peach, pear, and persimmon were attacked to the same extent from mid-August to October. These examples display the importance of this pest to a variety of fruits (Oakley 1950b).

General  
Distribution

The presence of D. dorsalis in Australia has not been determined. However, several species very similar in appearance to it occur in northern Australia and are of considerable economic importance.

Other distribution includes Bangladesh, Burma, Bonin Islands (Chichi-Zima), Caroline Islands (Kusie and Ponape), China (southern), Cambodia, India, Indonesia (Amboina, Batavia, Borneo, Celebes, Halmahera, Java, Sumatra, and Timor), Laos, Marianas Islands (Rota, Saipan, and Tinian), Malaysia, Nepal, Okinawa, Pakistan, Philippines, Ryukyu Islands, Sri Lanka, Taiwan, Thailand, and Vietnam. In the United States D. dorsalis is known from Guam and Hawaii (Oakley 1950b, California Department of Food and Agriculture 1971, Drew 1978).

There have been several instances of adult flies trapped in California beginning in 1960 (1966, 1967, 1969, and practically every year since) and some trappings in



Dacus dorsalis map prepared by USDA, APHIS, PPQ,  
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Florida, but only in 1974 have larvae been found (in the San Diego, California area) on the mainland. Apparently, the fly is brought to the California mainland regularly by some means, presumably from Hawaii, but has been eradicated successfully each time (U.S. Department of Agriculture 1970 and personal communication).

#### Hosts

Included in a host list of over 175 species are over 100 kinds of fruits and vegetables attacked by D. dorsalis. Since the host list is so extensive and varied the fruiting portion of almost any plant could probably be attacked by this fly (Boyce 1949).

Some of the most common hosts are the following citrus, stone, and pome fruits: Citrus spp. (grapefruit, lemon, lime, pummelo, sweet and sour orange, and tangerine); Prunus spp. (almond, apricot, common plum, damson plum, Japanese plum, myrobalan plum, and peach); Malus sylvestris (apple); and Pyrus communis (pear).

Other hosts include: Annona spp. (cherimoya, custardapple, and sugarapple); Ananas comosus (pineapple); Artocarpus spp.; Averrhoa spp.; Capsicum spp.; Carica papaya (papaya); Casimiroa spp. (white sapote); Chrysophyllum spp. (starapple); Cocos nucifera (coconut); Coffea spp. (coffee); Diospyros spp. (persimmon); Eriobotrya japonica (loquat); Eugenia spp.; Ficus spp. (common fig, Indian laurel fig); Fragaria spp. (strawberries); Garcinia spp.; Gossypium barbadense (sea island cotton); Inocarpus spp.; Lycopersicon esculentum (tomato); Mangifera indica (mango); Momordica spp.; Musa paradisiaca (banana); Olea europaea (olive); Opuntia spp. (pricklypear); Passiflora spp. (granadilla); Persea americana (avocado); Phoenix dactylifera (date palm); Pimenta dioica (allspice); Pimenta racemosa (bay rum tree); Pouteria campechiana (canistel); Punica granatum (pomegranate); Solanum spp.; Spondias spp.; Syzygium spp.; Terminalia spp.; and Ziziphus spp. (jujube) (Oakley 1950b, California Department of Food and Agriculture 1971).

#### Characters

ADULT - Length about 8 mm, larger than house fly. Body dull yellow with dark markings on thorax and abdomen. Median stripe forms "T" shape with additional transverse dark band on abdomen. Wings clear and narrow (an outstanding exception to the rule for fruit flies), with dark band along forward margin and short diagonal band near base (U.S. Department of Agriculture 1965, Drew 1978).

Both sexes show aging characteristics. One day old male testes white, gradually increase in size, then intensify to bright orange. After 5 days, testes later turn yellow, and after 10 days, become orange again and larger. Newly emerged flies generally light in color, gradually harden, and become darker with age (Maehler 1969).

(Fig. A)



D. dorsalis: A. Female adult

LARVA - Length about 10 mm, creamy white, headless, typical maggot shape without dark markings at broadened posterior end.

PUPA - Oval, length about 5 mm, tan to dark brownish yellow.

Larvae and pupae of most Dacus species are virtually impossible to identify to the species level with few exceptions. There are no morphological characters that can be used to distinguish these stages from most other Dacus species (Drew 1978).



EGG - Length slightly over 1 mm, slender, white, elliptical (California Department of Food and Agriculture 1971).

#### Characteristic Damage

Under population pressure, female adults will oviposit in any fleshy plant tissue. Oviposition in stems causes splitting and ultimate death of the plant (Armitage 1949).

Egg punctures in fruit allow decay organisms to enter. Larval feeding reduces the interior of fruit to a rotten mass. Conspicuous holes are left in the fruit when larva exit the fruit and drop to the ground to pupate (Oakley 1950b).

#### Detection Notes

1. Watch for prematurely dropped fruit and fruit with softened, darkened, and broken-down areas. Cut open suspect fruit to search for larvae (headless maggots).
2. Submit for identification any larvae from fruit pulp, especially if part of fruit is undamaged.
3. Watch for egg punctures in fruit. They are very small and may be surrounded by small elevated craters, or exude droplets of liquid. Emerging larvae leave larger holes.
4. Adults may be trapped with Steiner traps, in or near host trees, baited with methyl eugenol from May to October. Oil of citronella is also a good attractant.
5. Insects in the trap should be dipped out individually and submitted in 70 percent alcohol vials for identification (California Department of Food and Agriculture 1971).

#### Biology

Development from egg to adult takes less than 30 days. Large numbers of eggs are inserted into host fruit tissue. Larvae develop within the fruit and emerge fully developed, then enter the soil where pupation occurs. There is no hibernation period. Tests in Taiwan showed that the egg stage lasted an average of 27.1 hours at 32°C and 264 hours at 12°C, while immatures did not develop at temperatures lower than 12°C. Tests in Hawaii showed that the larval stage lasted 11-15 days and the pupal stage 9 days. Only three complete generations developed in Taiwan; while in Hawaii development was almost continuous.

The life cycle of D. dorsalis may be completed in 21 days in Hawaii under favorable conditions, but can be greatly prolonged up to 6 months at cool temperatures. The length of each stage varies under differing environmental conditions, with temperature being the chief factor. Ecological studies indicate that this species can adapt to a wide range of climatic conditions.

Mating begins at twilight and continues until dawn if temperatures are at least 17°C, not occurring in daylight except on dark overcast days. After mating, the female passes through a preoviposition period before laying fertile eggs. Females prefer to oviposit in mature or nearly mature fruit (green fruit may be attacked), usually after 10 days. One female will usually oviposit 500-1,000 eggs, 5-10 in a single puncture. The life cycle is usually completed in fallen fruit.

The adult's average life span is 90 days or less in nature, where it is acted upon by natural enemies, food limitations, and weather. Under laboratory conditions, the life span has reached 422 days.

Spread of the fruit fly is effected by adult flight, by wind, and by man's movement of infested hosts (Oakley 1950a and 1950b, Maehler 1969).

#### Control

Chemicals, sanitation, and trapping have been used to control D. dorsalis, but at considerable expense.

#### Natural Enemies

The search of the Southeast Asia area for natural enemies by the Hawaii Board of Agriculture and Forestry obtained 25 parasites (22 Opius spp.), in addition to the 4 already established in Hawaii, and the 2 predators. A total of 29 parasites and 1 predator species or varieties was released and 7 became established.

Of these, only Opius oophilus Full., an egg parasite obtained from Northern Borneo, Taiwan, and Thailand, was effective for control. This species is also found in Northern Philippines and Java. Full economic control was not obtained, but considerable reduction of D. dorsalis populations in guavas, the main host reservoir, was effected. Many formally infested hosts were free from attack. This parasite was also effective against the Mediterranean fruit fly (Clausen et al. 1965).



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